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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,285	11/25/2003	Peter Werner	MAN-013	5573

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EXAMINER

HU, SHOUXIANG

ART UNIT PAPER NUMBER

2811

DATE MAILED: 07/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,285

Applicant(s)

WERNER ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 May 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 4,5 and 17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5/02/05 & 4/04/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

In view of the previous Office action, claims 1-17 are pending in this application; and claims 1-3 and 6-16 remain active in this Office action.

Specification

The amendment filed on May 02, 2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added materials which are not supported by the original disclosure are as follows:

In amended paragraph 6, the insertion of the incorporated reference of Y.Q.Wang et al., Appl. Phys. Lett. 83, 347 (2203), as the corresponding foreign application of the instant case predates it.

In amended paragraph 52, the change from the term of "randomly distributed" to "substantially regularly spaced apart", as the distribution pattern shown in Fig. 6 is obviously substantially randomly distributed.

In amended paragraph 84, the deletion of the term "randomly".

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

Claims 3 and 8 is objected to because of the following informalities and/or defects:

Claim 3 recites the subject matter of "barrier layer", but it fails to clarify what is the natural of the barrier layer, especially, what it is intended to function against, oxidation, or contamination, or dopant diffusion, or etching?

Claim 3 recites the term of "the highest doping density", but such term lacks a sufficient antecedent basis in the claim; and it fails to clarify definitely where the recited barrier layer is located, as the recited "a side" is not quite comparable with the recited "one layer", both following the term of "between" in the claim.

Claim 8 recites the subject matter of "a metal silicide having a silicon lattice structure", but the disclosure lacks an adequate description regarding this subject matter, how and what type of metal silicide can be formed to still have a lattice structure of silicon. It would require the metal silicide possess same crystal structure and orientation, as well as same lattice constant, as the one for a pure silicon layer. And, no sufficient evidence for it is found in the example reference of Werner et al., provided in the 05-02-2005 amendment.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 and 6-16, as being best understood in view of the claim objection above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. ("Liu"; Appl. Phys. Lett. Vol. 75, No. 12, September, 1999, pages 1745-1747; of record) in view of Capasso et al. ("Capasso"; US 4,679,061).

Liu discloses a semiconductor structure (Fig. 1; also see particularly the left and right columns on page 1745) for use in the infrared region, which can naturally function in a range from 1.3 to 1.6 microns, comprising: an active zone consisting of a plurality of epitaxially grown alternating layers of Si and Ge (30 periods of Ge quantum dots sandwiched between silicon layers of 6 nm thick with a doping concentration of about $5 \times 10^{18} / \text{cm}^3$), wherein the active zone is located between a base layer (Si) and a cladding layer (Si); and the alternating Si and Ge layers of said active zone form a superlattice, and holes therein are naturally located in quantized energy levels associated with a valance band and electrons therein are naturally localized in a miniband associated with the conduction band and resulting from the superlattice structure, since the active zone has a structure with a dimension and a material set substantially the same as the one of the instant invention:

Although Liu does not expressly disclose that the base layer and the cladding layer can be doped with opposite dopants, one of ordinary skill in the art would readily recognize that such base and cladding layers with opposite dopants can be desirably and commonly formed in order to form a functional electrooptical and/or optoelectronic

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device which commonly requires injections of electrons and holes into the active region therein, as evidenced in Capasso (see the oppositely doped layers 3 and 7 in Fig. 1; also see col. 4, lines 20-22).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the oppositely-doped base and cladding layers of Capasso into the semiconductor structure of Liu, so that a functional electrooptical and/or optoelectronic device would be obtained.

Regarding claim 2, doping inhomogeneity naturally and hence a doping gradient (at least between the Ge and Si layers) naturally exist in the superlattice of Liu since the only the silicon layers are first doped.

Regarding claim 3, at least a lower portion of the cladding layer in the above collectively taught semiconductor structure can be regarded as a barrier layer, because it would be naturally formed of silicon same as that in the instant invention; and also because the cladding layer is normally heavily doped (as further evidenced in Capasso, see col. 2, lines 1 and 2).

Regarding claims 6, 10, 11 and 15, it is noted that the thickness of the Ge layers, the doping concentrations and/or alternating layers in the active zone are all of parameters of importance subject to routine experimentation and optimization. And, they each are respectively well within the art-recognized ranges for them.

Regarding claim 12, it is noted that Sb and P are each art-known for n-type dopants in Si; and, B and In are each art-known for p-type dopants in Si.

Regarding claim 16, it is noted that the thickness of the silicon layers in the active zone is a parameters of importance subject to routine experimentation and optimization. 16. And, it is art-known that thinner silicon layers in the superlattice is desirable in the for further improving overlap of the carrier functions, as evidenced in the prior art such as Eberl et al. (Thin Solid Films, 369 (2000), 33-38; of record; see the paragraph above Fig. 5).

Response to Arguments

Applicant's arguments filed on May 02, 2005 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., light emission, based on interband transition, recombination in the cladding layer, emitted light, heterostructure) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In further response to applicant's arguments, the recitation of "for use in the near infrared region, preferably in the range from 1.3 to 1.6 μm " has not been given full patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not

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depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Furthermore, the active region of Liu can naturally function in a range from 1.3 to 1.6 microns, since the active zone therein has a structure with a dimension and a material set substantially the same as the one of the instant invention, regardless whether the structure of Liu is optimized to function at such a wavelength range.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Capasso is cited by the examiner to show that it is art known that the recited base and cladding layers with opposite dopants can be desirably and commonly formed in order to form a functional electrooptical and/or optoelectronic device, as such diode-type devices commonly requires injections of electrons and holes into the active region therein, regardless what type of semiconductor materials are used therein. And, it is further noted that each of the oppositely doped layers 3 and 7 in Fig.1 of Capasso naturally functions as a cladding layer. Accordingly, it would have been well within the ordinary skill in the art to incorporate the oppositely-doped base and cladding layers of Capasso

into the semiconductor structure of Liu, so as to form a functional electrooptical and/or optoelectronic device with such active region.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

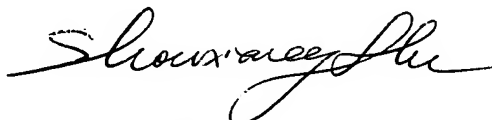
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH

June 27, 2005

A handwritten signature in black ink, appearing to read 'Shouxiang Hu', written in a cursive style.

**SHOUXIANG HU
PRIMARY EXAMINER**